

1	<b>Module Name</b>	<p><b>Project Work on Advanced Materials Modelling and Characterization</b>  Interdisciplinary tutorial at the joint EMRS-EUROMAT materials weekend <b>Sunday 20.09.2015 in Warsaw, Poland at 9:00</b>  Tutorial Modelling Description, <b>Introduction</b>, Prof. Peter Wellmann, Materials Department, University of Erlangen-Nürnberg, DE</p>	<b>5 ECTS</b>
2	<b>Courses</b>	<p><b>A</b> EMMC Initiative, Pietro Asinari, Politecnico do Torino, IT, 45 min  <b>B</b> EUMAT Initiative and activities in modelling and characterization from IK4-TEKNIKER, Amaya Igartua, ES, 45 min  <b>C</b> Modelling friction and wear behavior, Anssi Laukkanen, FI, 45min  <b>D</b> "Thermodynamic and kinetic simulations: The phase-field method", Ingo Steinbach, DE, 45 min  <b>E</b> Hands on session phase-field simulation by OpenPhase", Oleg Shchyglo 120min (<i>students needs their own computer</i>).</p>	3 ECTS
		<p><b>G</b> EMRS Fall meeting 2015  or  EUROMAT 2015 conference</p>	2 ECTS
3	<b>Teaching Staff</b>	<p><b>A</b> Pietro Asinari, POLITO, IT  <a href="mailto:pietro.asinari@polito.it">pietro.asinari@polito.it</a>  <b>B</b> Amaya Igartua, IK4-TEKNIKER, ES,  <a href="mailto:amaya.igartua@tekniker.es">amaya.igartua@tekniker.es</a>  <b>C</b> Anssi Laukkanen, VTT, FI  <a href="mailto:Anssi.Laukkanen@vtt.fi">Anssi.Laukkanen@vtt.fi</a>  <b>D</b> Ingo Steinbach, Ruhr-Univ. Bochum, DE  <a href="mailto:ingo.steinbach@ruhr-uni-bochum.de">ingo.steinbach@ruhr-uni-bochum.de</a>  <b>E</b> Oleg Shchyglo, Ruhr-Univ. Bochum, DE  <a href="mailto:Oleg.Shchyglo@rub.de">Oleg.Shchyglo@rub.de</a></p>	
4	<b>Module Coordinators</b>	<p>Prof. Peter Wellmann, Materials Department, University of Erlangen-Nürnberg, DE, <a href="mailto:peter.wellmann@fau.de">peter.wellmann@fau.de</a>  Prof. Dr. A. Lindsay Greer, Department of Materials Science &amp; Metallurgy, University of Cambridge, UK,  <a href="mailto:alg13@hermes.cam.ac.uk">alg13@hermes.cam.ac.uk</a>  Prof. Rodrigo Martins, Uninova, PT, <a href="mailto:rm@uninova.pt">rm@uninova.pt</a></p>	
4	<b>Syllabus Outline</b>	<p>Modelling activities – its past, present and future</p> <ul style="list-style-type: none"> <li>• Electronic, Atomistic, Mesoscopic, Continuous Modelling</li> <li>• Coupling and linking, Translators</li> <li>• Validators and End Users.</li> </ul> <p><b>Why?</b></p> <ul style="list-style-type: none"> <li>• Experimental <b>validation and modelling</b> of components in actual systems <ul style="list-style-type: none"> <li>○ Materials behaviour prediction;</li> <li>○ Materials life-cycle prediction;</li> <li>○ Design multiobjectives optimization.</li> </ul> </li> <li>• <b>Manufacturing process modelling</b></li> </ul>	

		<ul style="list-style-type: none"> <li>○ Macro-scale process simulation to optimise the production;</li> <li>○ Micro-modelling for microstructure prediction and its correlation with local mechanical properties;</li> <li>○ Residual stress and strain status at the end of the process.</li> </ul> <ul style="list-style-type: none"> <li>● <b>Opportunities for young researchers</b></li> </ul>
6	<b>Educational goals and Learning outcome</b>	<ul style="list-style-type: none"> <li>● Specific skills: Gain of broad and interdisciplinary knowledge in a modern topic of advanced materials, processes and applications</li> <li>● Soft skills: Ability to present own literature survey and to carry out a scientific discussion.</li> <li>● For all skills: Can explain, apply and reflect upon the theories, technologies, specialties, terminology, boundaries and different schools of their discipline (field of gained knowledge) critically and in depth.</li> </ul>
7	<b>Prerequisites</b>	Bachelor degree in Chemistry, Molecular Science, Physics, Nanotechnology, Materials Science or a related course
8	<b>Intended stage in the degree course</b>	Elective module during Master or Graduate Studies (interdisciplinary studies, soft skill training)
9	<b>Courses of study for which the module is acceptable</b>	M.Sc. and PhD-studies in Chemistry, Molecular Science, Physics, Nanotechnology, Materials Science or a related course
10	<b>Assessment and examinations</b>	<ul style="list-style-type: none"> <li>● Notes from attended conference (8 pages)</li> </ul>
11	<b>Calculation of the grade for the module</b>	<ul style="list-style-type: none"> <li>● Message by e-mail passed/failed.</li> </ul>
12	<b>Frequency of offer</b>	September 20 <sup>th</sup> , 2015, only 1 day
13	<b>Workload</b>	<ul style="list-style-type: none"> <li>● Tutorial day (lectures + hand on session): 5 h</li> <li>● Conference attendance (EMRS fall meeting or EUROMAT 2015 conference, September 2015 in Warsaw, Poland): 56 h</li> </ul>
14	<b>Duration</b>	1 semester / term
15	<b>Language</b>	English
16	<b>Preparatory reading / reading list</b>	Selected publication list of the tutorial speakers

### **Additional Information**

“Review of Materials Modelling. 4<sup>th</sup> version”, Edited by Anne F. de Baas and Lula Rosso, EU Commission, 2015